

# YAMAHA CA-2010

*Natural Sound Integrated Stereo Amplifier*

*High output power coupled with incredibly low distortion*

*Switchable class A operation*

*Built-in MC head amp and wide-range output meters*

*Completely independent recording and listening*





# Yamaha: Dedication to Musical Excellence

Today the world's largest manufacturer of musical instruments is also a leader in audio fidelity. For nearly a hundred years Yamaha craftsmen have been designing full, natural sound into our renowned pianos, organs, wind and string instruments—a rich musical tradition that makes us unique in the audio world. Part of the reason is our generations of musical sensitivity. But it's also due to our immense technological and production capabilities—built over decades of supplying fine musical instruments to the world.

## The Basics

Audio performance depends upon a wide range of technologies. While Yamaha's computer-controlled circuit design and testing is second to none, our musical instrument experience has given us expertise in many other crucial fields. The Yamaha factories which produce LSIs and semiconductors for our electronic organs were also important in the development of the revolutionary Yamaha vertical FET used in our top-line B-1 power amplifier and C-1 preamp. They are also responsible for our unique vapor deposition production of the world's only pure beryllium dome speaker diaphragms. After years of blending and forming the metals in our brass instruments, we were able to develop the special alloys used in our powerful speaker magnets. Piano frame diecast techniques are behind the ideal weight and acoustic properties of our turntable platters and speaker frames. And Yamaha piano soundboard research and cabinet woodcrafting is reflected in our resonant-free speaker enclosures and beautifully detailed component cabinetry.

## In-House

Every crucial part of every Yamaha audio component is Yamaha-made. That's how we set our own quality standards. And that's how we can afford to innovate every step of the way: when a part or material doesn't do justice to the music we simply develop one that does.

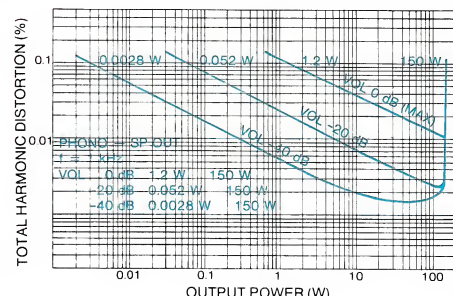
## The Payoff

When you have musicians and audio engineers speaking the same language the result is full natural sound fidelity, plus innovative features which translate directly into improved tonality or operating convenience. Yamaha's insistence on total music performance, not just isolated specs, is behind a revolutionary new approach to audio component design—one that gives the CA-2010 integrated amplifier (as well as all other models in the line) music fidelity audibly superior to many separate preamp and power amplifier combinations.

## Balanced Design for Total Performance—Input to Output

"Balanced Design" means we balance the quality of the phono equalizer, the preamp and the power amp stages in every Yamaha integrated amplifier. We don't boast of massive power output built at the expense of signal-to-noise ratio, distortion or other important preamp performance characteristics. Because we design each section to the same high standards, there are no weak links in a Yamaha amplifier. What's more, each section is matched from its very first design stages to the others, so all elements in the unit work together for superb music fidelity. That's why we dare to publish overall performance specifications for our amplifiers and receivers, from

Phono In to Speaker Out, while other manufacturers measure only the power amp and preamp separately, instead of under actual-use conditions.



## NDCR: An All-New Audio Design Philosophy

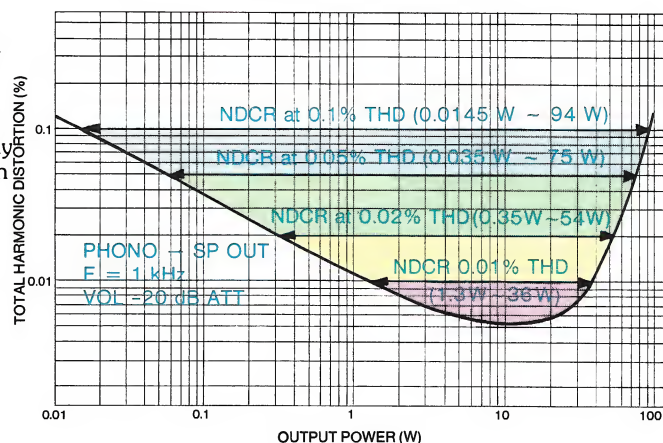
The CA-2010 is part of a new series of Yamaha audio components created for one purpose: to provide distortion-free natural sound in your home under actual listening conditions. To realize this goal we had to create a whole new method of measuring performance—Noise Distortion Clearance Range.

What does it show?

NDCR is a range—the whole range of powers for which total harmonic distortion and noise are below a rated level. It requires that all pertinent measurements be made under actual listening conditions. For instance, up to now power output has been stated as maximum RMS power at given distortion levels. But this maximum RMS power rating, useful as it is for some purposes, does not correspond to actual home performance conditions. Instead of the unrealistic maximum volume (0 dB) level, NDCR is measured at -20 dB volume setting, a normal listening level. And rather than measuring through the Aux In terminal, NDCR is taken from the more frequently used Phono In (through the equalizer amp) all the way to Speaker Output.

Finally, the actual measured range for the CA-2010 represents a superb achievement in distortion-free performance: 100 mW to 120 W, 20 Hz to 20 kHz. Translated into home listening, think of it this way: if you set your volume control for normal listening level, average power to your speakers will be 1-2 watts. A pianissimo passage in this case will be approximately 100 mW, and instantaneous peaks will reach 100 W. So the full range achieved by the CA-2010 assures superb, pure fidelity in every conceivable listening situation.

To us at Yamaha, NDCR is more than just a measurement. It reflects the design approach to all our music products. Because we pay such close attention to their sound in actual use, our engineers developed this assessment method to help build in the same tonal response for home audio enjoyment.



## In the Great Tradition

You probably know that Yamaha offers one of the world's most powerful and complete ultra-low distortion home audio component systems. It's also one of the most expensive. But with the CA-2010's excellent cost performance you get many of the unique features developed for the

spare-no-expense audiophile, including an MC cartridge head amp similar to that on the C-2 preamp, a switch which gives you power amp performance all the way down to DC (0 Hz) like the B-2 basic amp, and wide-range peak delay meters like those on the B-1 and B-2.





## THE PREAMP

From Phono In terminals to Pre Out the CA-2010 preamp section measures out at only 0.003% distortion for the entire 20 Hz to 20,000 Hz range. This level is just about the measurable limit for the finest test equipment.

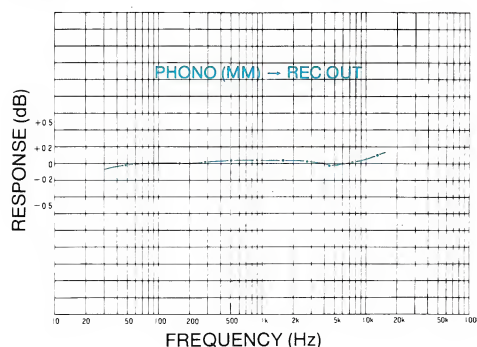
### Super-Quiet Equalizer Amp

The CA-2010 equalizer circuit employs special super-low noise FETs developed specially by Yamaha for this amplifier. Used in perfectly matched pairs, they are even housed in a single package to assure the same temperature effects on both at all times.

They are in a cascode-bootstrap current mirror circuit, first introduced in our prestigious C-2 preamplifier. This circuit assures ultra-low distortion, especially in the treble range.

The result of this combination is an outstanding 96 dB signal-to-noise ratio (10 mV input, IHF A network, inputs shorted), with less than 0.003% distortion from 20 to 20,000 Hz (Phono to Rec Out)!

RIAA Deviation (Phono MM to Rec Out)

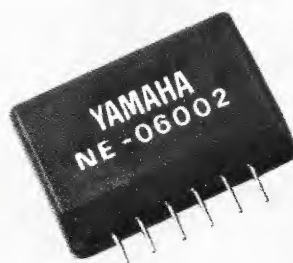


### Built-In High-Performance Head Amp

Your present phono cartridge may sound fine today, but after your ears become accustomed to the subtle beauties of class A performance, you may feel the need for the improved tonal nuances offered by moving coil cartridges which are now gaining in popularity. At that time you could have a problem: the MC cartridge's output is too low for preamp phono inputs, presenting the tough choice of whether to pay the high cost of a special external head amp or suffer the limitations inherent in most step-up transformers.

With the CA-2010 there's no problem. A special IC chip, Yamaha-developed for the C-2, is used to form a unique built-in head amp, conveniently switchable on the front panel. It boasts an outstanding 85 dB signal-to-noise ratio for 250  $\mu$ V input, a figure rarely achieved for MC inputs, and comparable to most competitors' high level phono input specifications. It all adds up to a musical extra: crisp, accurate transients and extremely low distortion (under 0.03%, 20 Hz to 20,000 Hz for a 3 V output).

Super Low Noise IC



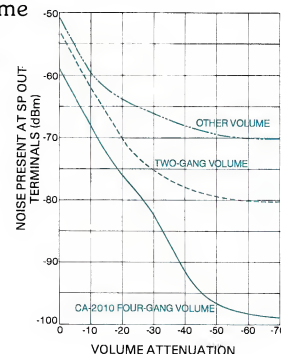
### Phono Impedance Selector: A Creative Tool

In addition to its MC cartridge setting, the Phono 1 selector has three impedance positions: 47 k $\Omega$ , 68 k $\Omega$  and 100 k $\Omega$ . This lets you match the impedance characteristics of any cartridge, but it also has other uses. Resetting the impedance position can work subtle effects on the frequency characteristics of any cartridge, especially in the treble range.

Use the selector's front panel convenience to experiment with your cartridge, and to compensate for any ill effects of phono cable capacitance.

### Precision Four-Gang Volume Control

This type of control was introduced on the famous Yamaha C-1 and C-2 preamps. By adjusting the volume both at the input side (normal two-gang types), and also at the output side of the tone control section, it lets you turn down preamp residual noise when you turn down the volume. You not only get cleaner low-volume listening, but this keeps the power amp from running at full gain while you are listening at reduced levels.



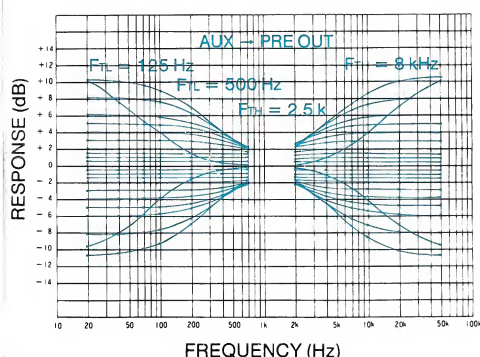
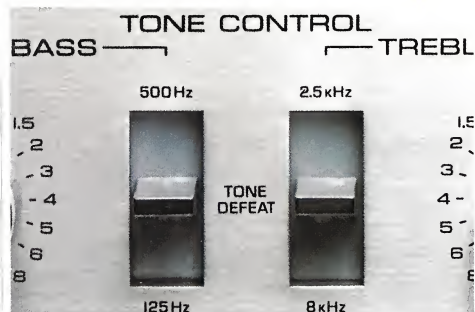
Noise Level and Volume Attenuation from Phono to Sp Out (1 kHz, IHF-A network)



## Comprehensive Tone & Filter Controls

### Tone Controls

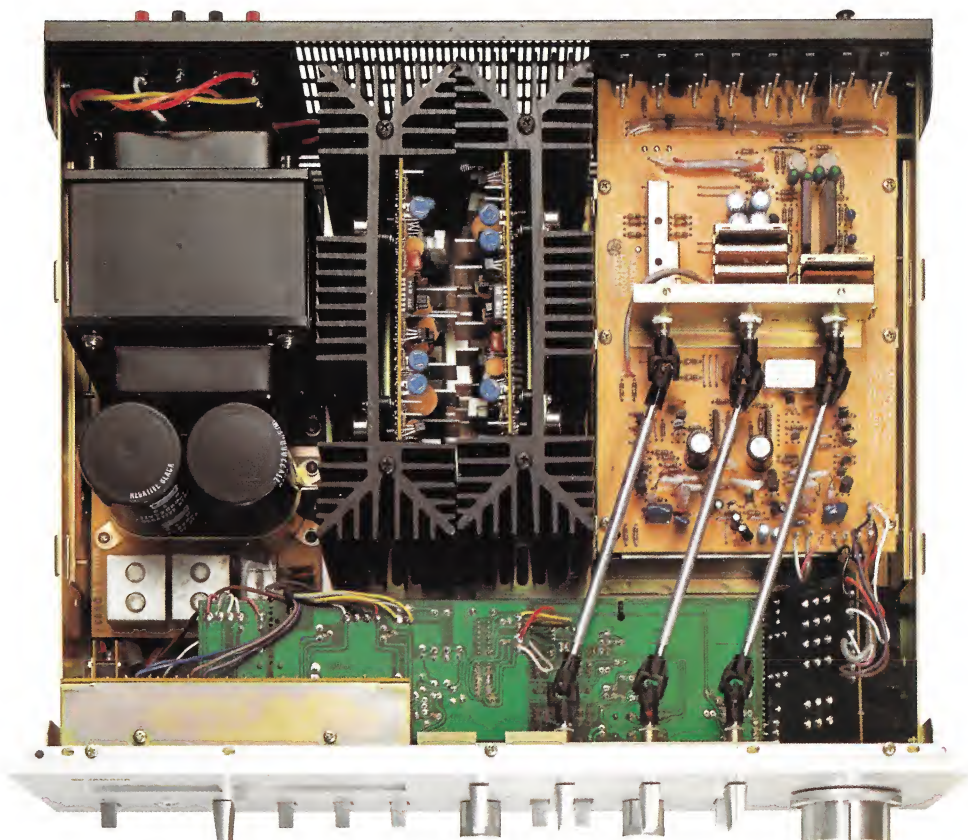
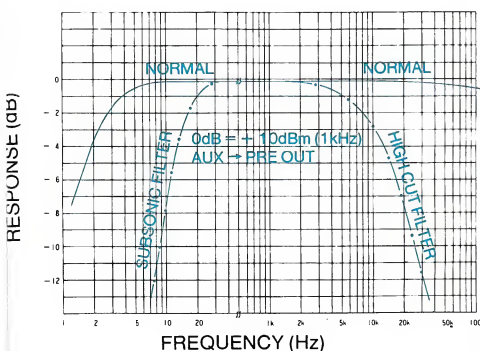
This section employs separate volume controls for bass and treble frequencies, assuring precise and delicate adjustment of tone color to equalize for room acoustics or irregular speaker response, and to match your mood. Dual turnover frequencies for both ranges double the versatility by letting you choose the frequencies at which each control operates—selection similar to full equalizer units. For more precise tone adjustment, both controls are calibrated in dB steps.



### Filters

Both of these filters have sharp 12 dB/octave cutoffs for clean, efficient operation. The 10-kHz high filter can be used to cut record scratches as well as hiss from tapes and weak FM signals. During normal operation leave the 15-Hz subsonic filter on to boost overall power by eliminating the power-robbing subsonic noise generated by warped records or line noise.

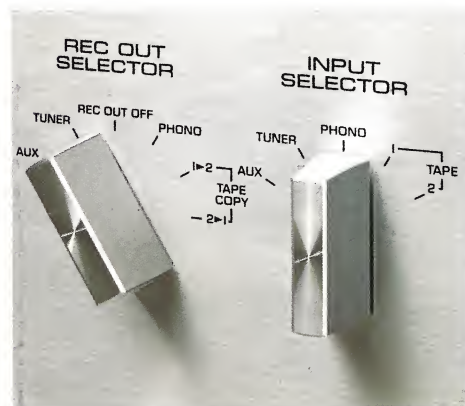
### Filter Characteristics



### Completely Independent Recording and Listening

This Yamaha first lets you record any source selected by the Rec Out selector, while at the same time listening to that or any other source set by the Input selector. For example, you can record an FM program (Rec Out set to Tuner) while listening to a record on your turntable (Input set to Phono). Or you can go on listening to the tuner or records when a friend comes over to copy tapes (with two decks connected, the Rec Out selector lets you copy tapes directly in either direction).

The Rec Out selector features an Off position which prevents signals from passing to the recording jacks when they are not in use, isolating the circuit from any stray capacitance in deck connector cables and avoiding a possible source of distortion.



### Audio Muting Switch

This switch has three handy settings: 0 dB for normal listening, -20 dB to cut the signal to the speakers by 90%, and Pre Out Off. The -20 dB position lets you temporarily reduce the volume to prevent speaker damage which can result from a dropped stylus while changing a record, then switch back to normal level without having to readjust the volume control.



### Other Important Features

- Sure, Screw-Down Speaker Connectors
- Terminals for Two Sets of Speakers With Front Panel Switching
- Stereo Headphone Jack
- Large Easy-Use Volume & Balance Controls
- Four Auxiliary AC Outlets



# THE POWER AMP

## Incredibly Reduced Distortion!

When Yamaha's first amplifier line appeared with only 0.1% distortion audiophiles were astounded. But now we've bettered that by cutting IM and total harmonic distortion to an unbelievable 0.03% (20 to 20,000 Hz, 8 ohms, both channels driven at rated output). In other words, our state-of-the-art distortion figures have been improved by a whopping 70% in the CA-2010 for even cleaner, purer performance.

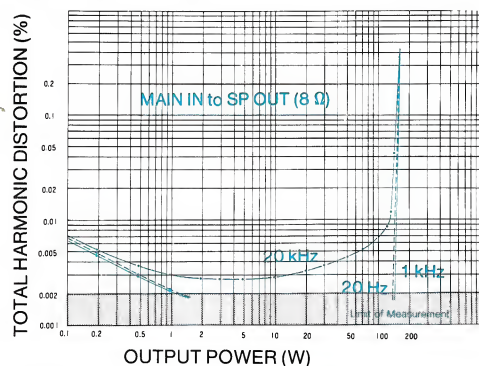
## Switchable Class A Operation

Yamaha was the first to offer switchable class A and normal transistor amp class AB operation, and it's yours on the CA-2010 for incredibly low distortion to bring out the best in delicate music passages.

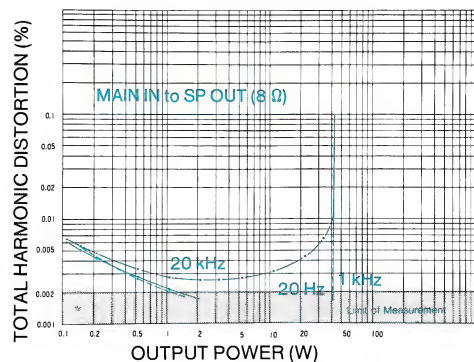
Class A operation employs the CA-2010 transistors without switching between several elements for high-power efficiency. This means none of the notch and crossover distortion present in all class B amplifiers, with, however, lower maximum power in class A mode.

The result is clean, transparent response for the most demanding listening situations, and plenty of power for headphones, efficient speakers and normal listening levels. You also have the option of switching back to Normal mode when you want to put full power behind your music.

Output Power vs. Total Harmonic Distortion  
(Class B operation, both channels driven)

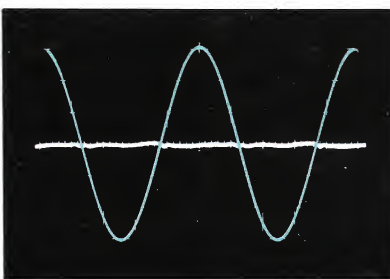


Output Power vs. Total Harmonic Distortion  
(Class A operation, both channels driven)



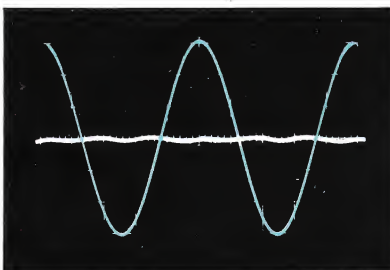
Note that both class A and class B provide ultra-low THD at normal listening levels. Distortion begins to climb for class A at 30 W; here class B should be used.

Distortion Waveform for Class B Operation  
(Both channels driven into 8 Ω at 15 W)



Vertical Sensitivities: 5 V, 1 V/div.  
Horizontal Sensitivity: 10 μsec./div.

Distortion Waveform for Class A Operation  
(Both channels driven into 8 Ω at 15 W)

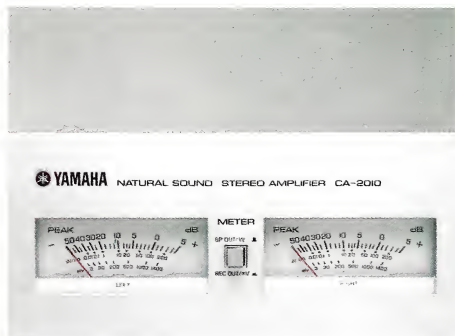


Vertical Sensitivities: 5 V, 1 V/div.  
Horizontal Sensitivity: 10 μsec./div.

Note the reduced distortion component in class A (absence of notch distortion). You can hear the difference!

## Wide-Range Peak Delay Meters with Unique Rec Out Indication Switch

These versatile meters are a far cry from conventional VU types. They have a quick rise time of 100 μsec., so they can indicate even the briefest of transient bursts. Thanks to their wide range they can respond to levels from a whisper-quiet 1 mW to a thunderous 316 W (with 8-ohm speakers), without the need for range switching. And as on our famous top-line C-I preamp, the CA-2010 meters can be switched to show the signal level from the Rec Out jacks. Now you can measure the exact output to your tape deck with no guesswork, for ideal recording level settings to keep the recording above the tape noise level yet below the limits of distortion-free performance. To help you, the meters also feature actual-level calibration in millivolts.

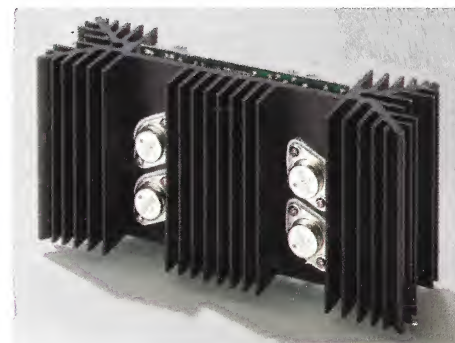


## No Temperature Worries: Heat Sink Design & ASO Protection

In class A operation the transistors are working full time and must dissipate much more power, as heat. The CA-2010 keeps cool by incorporating massive power transistor heat sinks with low thermal capacity. For added protection, an Area of Safe Operation (ASO) sensing system is also used. Special circuits monitor power transistor current. As soon as excess current is sensed, input level is limited.

These circuits also operate if speaker impedance drops below 4 ohms, protecting both speakers and amp against shorts and misconnection.

### Heat Sinks



## Pre Out/Main In Coupler Plus...

The preamplifier signal can be fed out to a frequency divider, dbx or Dolby unit, or frequency equalizer, then back in through the Main In jacks, or to another power amplifier. A special rear panel switch does away with the need to connect preamp and power amp sections with external jumpers, and since switch terminals are inside the chassis, they are shielded from the interference that jumpers often pick up. Even during normal operation the Pre Out jacks remain live, to let you check the signal with an oscilloscope or feed it to drive another power amp, all without interrupting the program. You can also record from these jacks, which gives you the advantage of being able to "process" the signal first with the tone controls and filters.

## Unbelievable 118-dB Amplifier Signal-to-Noise Ratio!

The CA-2010 amp is almost unimaginably quiet. Suppose you're listening to music with a huge dynamic range—for example, 60 dB—even the quietest passages are still 58 dB (118-60) above the noise threshold! This level of perfection was made possible through detailed selection and control of parts quality and exhaustive computer-assisted circuit design.

## SPECIFICATIONS

### MINIMUM RMS OUTPUT POWER PER CHANNEL (CLASS B)

120 Watts (8 ohms) from 20 to 20,000 Hz at no more than 0.03% Total Harmonic Distortion

MIN. RMS POWER PER CHANNEL (both channels driven)	
Class A (20 to 20 kHz, 8 $\Omega$ )	30 watts
Class B (1 kHz, 8 $\Omega$ )	125 watts
TOTAL HARMONIC DISTORTION, 20 to 20,000 Hz	
Phono 1 (MM), 2 to Rec Out	0.003% at 5 V output
Phono 1 (MC) to Rec Out	0.03% at 3 V output
Aux, Tuner to Pre Out	0.005% at 3 V output
Main In to Sp Out (8 $\Omega$ )	Class A: 0.005% at 15 W Class B: 0.01% at 60 W
Tuner to Sp Out (8 $\Omega$ )	Class B: 0.01% at 60 W
IM DISTORTION (Aux to Sp Out)	0.03%, 250 mW to 120 W
INPUT SENSITIVITY/IMPEDANCE	
Phono 1 (MM)	2 mV/47, 68 or 100 k $\Omega$
Phono 2 (MM)	2 mV/47 k $\Omega$
Phono 1 (MC)	50 $\mu$ V/10 $\Omega$
Aux, Tuner	120 mV/50 k $\Omega$
Main In terminals	1 V/50 k $\Omega$
MAXIMUM INPUT LEVELS (1 kHz, 0.02% THD)	
Phono 1 (MM), 2	310 mV
Phono 1 (MC)	7.5 mV
Tuner, Aux	20 V
OUTPUT LEVEL/IMPEDANCE	
Rec Out terminals	120 mV/600 $\Omega$ (rated), 18.6 V (max., 1 kHz)
Pre Out terminals	1 V/500 $\Omega$ (rated), 7 V (max., 1 kHz)
FREQUENCY RESPONSE	
Phono 1, 2 RIAA deviation	$\pm$ 0.2 dB
Tuner to Pre Out	5 Hz to 100 kHz, +0, -1 dB
Tuner to Sp Out	5 Hz to 50 kHz, +0, -1 dB
POWER BANDWIDTH (8 $\Omega$ , 0.03% distortion)	
Class A	10 Hz to 70 kHz (15 W output)
Class B	10 Hz to 50 kHz (60 W output)
TONE CONTROL CHARACTERISTICS	
Bass turnover frequencies	125 and 500 Hz
Bass boost/cut	$\pm$ 10 dB at 20 Hz (for 500 Hz)
Treble turnover frequencies	2.5 and 8 kHz

Treble boost/cut	$\pm$ 10 dB at 20 kHz (for 2.5 kHz)
FILTERS	
Subsonic	15 Hz (12 dB/octave)
High	10 kHz (12 dB/octave)
SIGNAL-TO-NOISE RATIO (IHF, A Network)	
Phono 1 (MM), 2	96 dB (for 10 mV, shorted)
Phono 1 (MC)	85 dB (for 50 $\Omega$ , shorted)
Aux, Tuner	100 dB
Main	118 dB
Residual noise (at Vol. min.)	Less than 70 $\mu$ V

NOISE DISTORTION CLEARANCE RANGE (NDCR) for 0.1% into 8  $\Omega$ , 20 Hz to 20 kHz, from 100 mW to 120 watts with Vol. -20 dB (Phono In (MM) to Sp Out)

DAMPING FACTOR (at 1 kHz) Better than 45 into 8  $\Omega$

#### METERS

Rise time	100 $\mu$ sec.
Decay time	0.95 sec.
Range	1 mW to 316 W (8 $\Omega$ ) (-50 dB to +5 dB)

#### GENERAL

SEMICONDUCTORS 98 Transistors, 67 Diodes, 6 FETs, 4 Dual FETs, 1 LED, 3 ICs

#### POWER SUPPLIES

U.S.A. and Canada: AC 120 V, 60 Hz  
Australia: AC 240 V, 50 Hz  
Other Areas: AC 110/120/130/220/230/240 V, switchable; 50/60 Hz

#### POWER CONSUMPTION

U.S.A. and Canada: 450 W, 550 VA

#### DIMENSIONS

Other Areas: 900 W

#### WEIGHT

461 x 170 x 360 mm  
(18 1/8" x 6 5/8" x 14 1/4")

U.S.A. and Canada: 20 kg (44 lbs.)

Other Areas: 21 kg (46 lbs., 5 oz.)

Specifications subject to change without notice.

For details please contact:

SINCE 1887



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